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IN THIS ISSUE

	Page
Land Reclamation in Yugoslavia	191
Shelter Belts in Italy	196
Petch Barrage	199
Wheat Processing and Uses in the Far East	204
European Cooperatives	208
Technical Cooperation With Eastern Countries	211

FRONT COVER

Yugoslavian Beet Workers

Thinning sugar beets on the Njegus collective farm at Lovcenac, near Novi Sad. Beets require a great deal of hand labor. (Photo courtesy of R. J. McGinnis.)

BACK COVER

Land Reclamation in Yugoslavia, 1950

This map shows how Yugoslavia hopes to obtain more tillable land through drainage and irrigation projects.

NEWS NOTES

FAO Livestock Conference

Livestock technicians of the American Republics will meet to discuss their mutual activities at a conference scheduled for October 9 to 20 at Turrialba, Costa Rica. The conference is sponsored by the Food and Agriculture Organization of the United Nations, in cooperation with the Inter-American Institute of Agricultural Science, which is making its facilities available for the meetings. Breeding, nutrition, and control of diseases are among the aspects of livestock production scheduled for discussion. Consideration also will be given to opportunities for governments to work together more closely through FAO.

International Sugar Agreement

Considerable progress has been made during recent months toward a new International Sugar Agreement. Heavy international buying of sugar since the outbreak of the Korean War, however, has so changed the world picture that the future negotiation has now become uncertain.

The International Sugar Council met in London July 20 and voted to submit a draft of a new agreement to governments. Tentative plans are to have another meeting of the Council in October when governments will be asked to submit their views.

USDA Expands Foreign Visitor Assistance

The number of persons visiting the United States to become familiar with its agriculture is increasing steadily. The United States Department of Agriculture, in response to this growing interest, is now setting up special assistance facilities. A new Education and Training Division is being established in the Office of Foreign Agricultural Relations and it will be the Department's focal point for aiding the agricultural visitors, students, and trainees from other countries. The Division will coordinate the Department's relations with the visitors, assist with their orientation, help prepare plans for desired study and training, and seek the close cooperation of State institutions and services in meeting such needs. Douglas Ensminger, formerly head of the Educational Research Section of the Extension Service, will head the Division.

Credits for photographs is given as follows: p. 193, Pauline McD. Michael; pp. 194, 195, R. J. McGinnis; pp. 206, 207, U. S. Army; p. 210, C. Freen.

FOREIGN AGRICULTURE — ALICE I. FRAY, EDITOR

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Land Reclamation in Yugoslavia

by JOHN J. HAGGERTY

Bringing new land into production and increasing the productivity of cultivated land are among the major problems faced by Yugoslavia in its program for economic development. Counting all land in farms, Yugoslavia has only about 2 acres per inhabitant for its current population of nearly 16 million people, and a little more than 1 acre of arable land per person. Anticipating normal growth in population to about 25 million in the next generation, and with measureably limited land resources, it is important to Yugoslavia that it achieve maximum productivity of all land suitable for farming. In 1939,[1] Yugoslavia had 36.0 million acres of land in farms, but only 18.8 million were in field crops. It may be assumed, however, that much of the remainder, consisting of garden patches, meadows, pastures, vineyards, and orchards, not only was cultivable but also was already making a substantial contribution to the food supply.

It is not likely that any appreciable change has occurred in the over-all figures since 1939, the most recent year for which reliable data are available. Certainly no considerable area of additional land has been brought as yet into general agricultural use. Of the reclamation activities initiated since the end of the war in 1945, those that have been completed up to the present time would not bring the total arable land area above its prewar level. This assumption is supported by Marshal Tito's statement at Drvar, on March 12, 1950, that only 16.8 million acres were planted in 1949 and 18 million in 1948.

The urgency of the land problem is recognized in the Five-Year Plan by the prominent place given to land reclamation. The plan provides for drainage of marshes and flood protection on 400,000 hectares,[2] mentioning specifically the Lonjosko Polje in Croatia, Lake Skadar in Montenegro, Pelagonia in Macedonia, and other projects. The existing drainage systems are to be improved and extended, with the installation of additional pumping facilities including new hydroelectric developments for this purpose.

Irrigation of 400,000 hectares is also contemplated in the Five-Year Plan, particularly in the subtropical regions subject to intense summer heat and extended drought during the growing season.

A basic problem that may be receiving insufficient attention up to now is the necessity for control of erosion, the fundamental cause of stream siltation, stoppage of natural and man-made drainage ways, and consequent inundation of otherwise arable valleys. For the most part, the excessive erosion in the southern mountain regions can be directly attributed to destruction of the forest and grass cover that shielded the soil against torrential rains and held it in place on the mountain slopes. The only certain cure for this condition lies in reestablishment of protective vegetative cover on the denuded slopes.

Primary dependence in these projects has been placed on manual labor. Men, women, and youth, for the most part organized into voluntary work brigades, have worked millions of man-days and moved millions of cubic meters of earth in the creation of new farm lands and for flood protection and improvement of land already in farms. Provision is also made for permanent workers in this activity, particularly the necessary engineers and other skilled personnel. In 1950, Government funds totaling 345 millions of dinars[3] are set aside for land-reclamation work, equivalent to the total amount spent for this purpose from 1947 through 1949, and, according to recently published figures, more than three times the amount spent on land amelioration during the 15-year period 1923–37.

These expenditures in land reclamation represent a substantial investment for future productivity that may require many years before full paying status is achieved. The initial removal of surplus water from long-established swamps or the initial irrigation development on historically arid plains merely establishes the physi-

[1] Representing 58.8 percent of total land area in 1939. Figures are from "Statistique Agricole Annuelle," 1939, Ministry of Agriculture.

[2] A hectare equals 2.47 acres.

[3] The official exchange rate is 50 dinars to $1.

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cal basis through which true reclamation of the land during a period of agricultural use can be achieved. In some instances, excessive salinity must be gradually reduced by abundant irrigation; in others, soil acidity must be corrected. Not infrequently, the determination of what crops to grow in the initial few years must be based upon their tolerance to existing soil conditions rather than upon their economic value. It may be years before the soil can be corrected to the required tolerances of the more profitable and economically useful crop plants.

The land-reclamation objectives of the Five-Year Plan have been attacked with vigor, and a surprising amount of progress has been achieved, when one considers the almost total absence of heavy equipment and other modern methods.

Macedonia

In Macedonia, for example, it is reported that more than 5,500 hectares of swamps have already been reclaimed and 1,600 hectares improved by irrigation.

One of the more important swamp areas being reclaimed is in the Strumica Valley, an area suited to the production of a wide variety of such subtropical crops as cotton, tobacco, rice, and peanuts. Land reclamation in the Valley was begun in 1947, largely through use of volunteer work brigades, particularly of youth. By the end of last year, some 4,300 hectares had been drained or protected from flooding. Reported yields of maize obtained in 1949 on newly reclaimed land substantially exceeded those on old fields in the area. Another 3,000 hectares will be drained and 11,000 irrigated under projects already begun as a part of the Five-Year Plan. In the Vardar Valley, from Skoplje to the Greek border, several areas offer opportunities for irrigation and drainage. The Plains of Skoplje, for example, are being drained and protected by stream channel clearance in the Vardar River to provide an additional 10,000 hectares of land for farming. Near Djevdjelia, close to the Greek frontier, another 7,000 hectares of potentially good bottom lands is to be taken back from the river.

The Kocane area of the Bregalnica Valley, northwest of Stip, has an estimated additional 1,000 hectares of newly reclaimed land already planted to rice in 1950. This Valley has historically been Yugoslavia's principal source of rice and important for its tobacco and poppies for opium.

The Pelagonia, an extensive plain within the Crna Reka Valley running from above Prilep through Bitolj to and beyond the Greek border, provides one of the most significant and promising opportunities by which Yugoslavia may add to its food resource base. Within this level plain, 50,000 hectares of once-fertile land are inundated all or part of the year as a result of siltation of the stream channel. Work has already begun to lower the river bed as a first requirement to the rapid removal of excess water. Projected future works include a network of canals throughout the plains and the construction of an impounding dam where the river enters the plain from the mountains to provide for both irrigation and hydroelectric power.

Montenegro

As one of the agriculturally backward Republics, Montenegro is receiving much of the attention being devoted to land reclamation. A new capital city, Titograd, is being built; and, anticipating the establishment of this substantial metropolitan center, primary interest in land reclamation in the region is being directed to the producing of food and other resources needed to support the population and the industries expected to develop.

South of Titograd at Ljeskopolje, irrigation projects were begun 3 years ago. According to reports, the main canal was finished in 1948 and a network of auxiliary canals and a dam on the rivulet Tresnica are completed or nearing completion. A few hundred hectares of land are already being irrigated and the total area of 1,000 hectares is expected to be irrigated this year.

North of Titograd in the Bjelopavlici Valley, along the lower course of the Zeta River, plans for irrigating 4,500 hectares of tobacco, cotton, and fruit land are under way. About a quarter of this land should be under irrigation at the end of the present summer. Further up the Zeta River above Titograd, 5,600 hectares of land are also being reclaimed in the vicinity of Niksic.

Early last year work was begun on the Lake Scutari Project, which, before Yugoslavia's break with the Cominform, was to have been a more ambitious project embracing 44,000 hectares, two-thirds of which were in Albania. Yugoslavia has now gone ahead with a more limited plan, which is expected to reclaim 13,500 hectares of farmland by next year. Scheduled for completion this year is the construction of dikes along the east bank of the Moraca River, from its confluence with the Cijevna River at the village of Goricane, downstream toward the Island of Vranjini. One of the important developments in connection with this project has been the erection of a bridge over

the Moraca River to the stone quarry at Vukovci from which stone is transported by narrow-gage railway to the areas where the dikes are being built along the opposite bank of the river.

South of Scutari Lake, in the southernmost part of Montenegro, reclamation is going forward on the flooded flat lands adjacent to the Bojana River near Ulcinj and Stoj. According to a statement issued in January, about 3.5 miles of dike had been constructed in the Ulcinj area, protecting some 400 hectares of land from flooding. In the nearby Stojsko Polje some 100 hectares of reclaimed land have already been planted to fruit trees, according to reports.

Near Hercegnovi in Sutorina, reforestation work and regulation of the turbulent Sutorina River were begun 3 years ago. Some work has been done on the river bed and on the construction of the irrigation canals.

Bosnia—Hercegovina

The Mostarsko Polje or plain, surrounding the city of Mostar, is one of the largest areas in Hercegovina being reclaimed. It is reported that in the Drinovatsko blato (swamp or mudflat) alone, 6,000 hectares of fertile land have already been reclaimed and produced good crops of cereals, tobacco, and cotton last year. Irrigation canals are under construction in the section from Slavkovac to the confluence of the Buna with the Neretva River, and the Mostarsko blato is being drained.

Drainage or irrigation projects are also under way in other areas, including the Trebisnjica Valley and in such Imotako as Fatnicko and Dabarsko Polje.

Croatia (Dalmatia)

During the past 5 years, much has been done to promote Dalmatia's agricultural production. Among

Farm family in the mountains of Bosnia. The steeply pitched roof is common in this area.

In Yugoslavia, barnyard manure is recognized for its fertilizing value.

other things, a plan for reclaiming about 30,000 hectares of land is being carried out. This land will produce fine quality grapes, cotton, Mediterranean fruit, early vegetables, and a variety of other products.

Serbia (Kosovo-Metohija)

In the Kosmet, south of the town of Djakovica, brush is being removed from some 100 hectares of swampland and irrigation canals are being built across the cleared land. There remains about 40,000 hectares of swamp to be reclaimed in the area, however.

Serbia (Vojvodina)

The major current project in the Vojvodina is the Danube-Tisa-Danube Canal, which will connect and enlarge existing canals from Bezdan, where the Danube enters Yugoslavia from Hungary, to Palanka, near the junction of Yugoslav and Rumanian frontiers. Aside from improvement to navigation, this project upon completion will benefit more than 500,000 hectares of land through irrigation, at the same time contributing substantially to solution of the drainage problems of the Backa and Banat areas.

Serbia, Bosnia, and Croatia (Sava Valley)

In the Sava bottom lands, commonly referred to as Posavina, are many areas of low flatlands, subject to periodic or chronic flooding because of their lowness, poor drainage, and the inadequacy of the channels of the Sava and its tributaries to move out the excess water resulting from spring floods. These areas occur on either side of the main river, falling in Croatia, Bosnia, or Serbia, but for convenience are grouped together in this report.

Southwest of Belgrade in Tamnava, during 1949, brigades of the local People's Front are reported to have drained 1,880 hectares of land chronically flooded by the River Gracica.

Three years earlier, mainly through youth work brigades, digging of drainage canals was begun in one of the more important areas just west of Obrenovac and extending to the vicinity of Skela. It is claimed

that 25 miles of canal had been completed by mid-1947, making possible the cropping of 4,000 hectares of new land.

In the Bosnian section of the Valley, 90,000 hectares were drained and protected from floods, according to reports issued in January. It is claimed that 20,000 hectares of hitherto unused land were made available for agriculture in the Basanska Sarnac area alone and that modern hog farms are already being built on reclaimed land.

The Jelas project, just west of Brod, has received a great deal of attention during the past 2 years. It is reported that 6,000 hectares of swampland have been reclaimed, the greater part of which is being planted this year, and that last year 600 hectares were planted to rice with notable success and more than 1,600 to such crops as hemp, cabbage, kale, and oats. Current work in the area is concentrated on constructing dairy and hog barns, stables, granaries and warehouses, dwellings, and administration buildings.

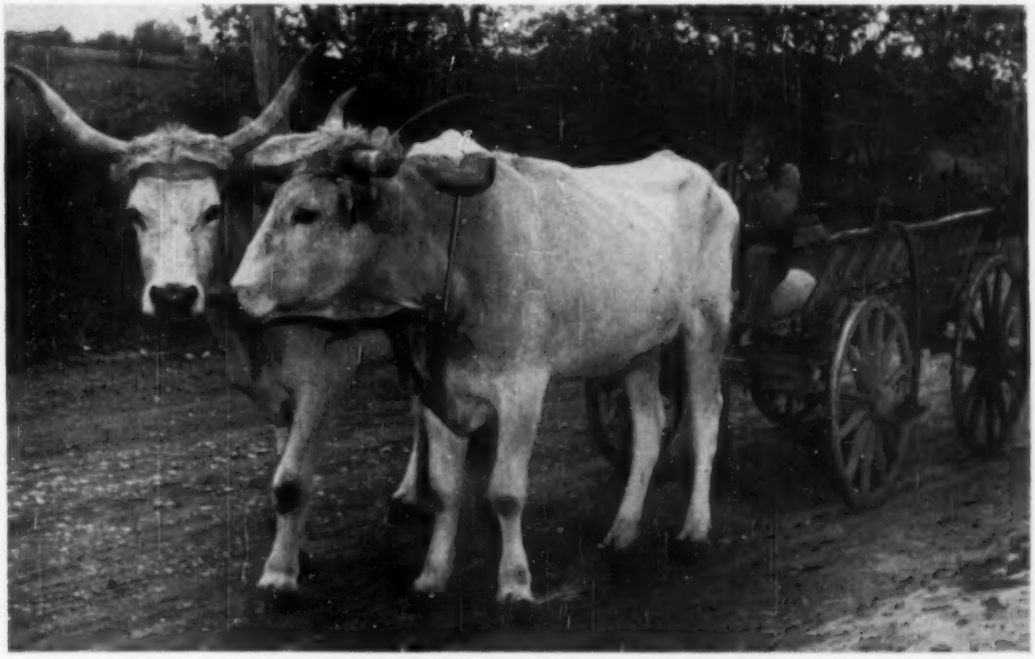
One of the largest and most promising reclamation areas contemplated under the Five-Year Plan is that at Lonjsko Polje, extending down the Sava Valley below Sisak. According to early reports, 160,000 hectares of land were to be reclaimed. More recent statements, however, indicate that only some 80,000 hectares can be improved through drainage, flood protection, and supplemental irrigation.

Best progress has been made, according to published statements, in the vicinity of Topolovac, where a few miles of dike to protect against flooding by the Lonja River have already been built. On the area protected by this dike, a network of canals 25 miles long was scheduled for construction last year as was an electrically driven pump station.

Slovenia

Just north of Ljubljana, near the town of Kamnik, brigades of the People's Front began last year to dig 3 miles of drainage canals to connect the Psata River with the Bistrica Kamnik. The canal is to intersect the valley, running from the village of Topolje near Mengas to the Bistrica near Jaras. Additional work is being done on the minor streams of Depalsca, Sridnik, and Struga.

When the land has been reclaimed, it is to be developed as a collective farm to supply the city of Ljubljana.



The oxcart is a familiar sight on the country roads of Yugoslavia.

Trieste (Zone B Territory) and the Istrian Peninsula

In the valleys of the Mirna and Dragonja Rivers, both within Zone B of the territory administered by Yugoslavia, work is going ahead on a combination drainage and irrigation project.

In Istria, one of the most important projects being carried on is the land reclamation scheme of the Rasa River. By canalizing the river, some 2,000 hectares of arable land were scheduled to be reclaimed last year. A collateral benefit anticipated is protection of the coal mine Potpican from floods. Six miles of the river bed were to be canalized in 1949, as well as the torrents Posert, Krsan, and Beli Potok, and a network of canals was to be constructed for diverting water from the Potpicane River. The work is to be continued this year on the middle course of the Rasa.

In the valleys of the Mirna and Dragonja, together with small additional areas at Ankara, Kopar, and Sveti Nikoloj, 300 hectares of the 3,500 to be reclaimed were planted this year.

Shelter Belts in Italy*

by J. H. STOECKELER

Shelter belts are helping to provide an answer in Italy's Agro-Pontino to the long-standing problem of obtaining wood for fuel and protecting crops from searing summer winds. More than a million trees have been planted since 1937, most of them species native to Australia, North America, and Asia.

Italy's combination of a rapidly growing population, a scarcity of good farm land, and insufficient natural fuel resources places heavy pressure on the soil. Some of the soil, then, must do double duty. Shelter belts in the Agro-Pontino area are making it possible to do precisely that. In combination with the production of wood from natural woodlands nearby, they are going a long way toward meeting the area's fuel wood needs, and tests have shown that crop yields in fields protected by full-grown eucalyptus trees can be expected to increase by 5 to 10 percent.

The Agro-Pontino is a reclamation project about 35 miles southeast of Rome. A malarial swamp a decade ago, the area is now a thriving agricultural development of about 5,000 farms, which produce cereals, sugar beets, and cotton. It was reclaimed in the thirties from the Pontine Marshes, a tract of about 346,000 acres, containing some coastal dunes and scrub and forest growth on the uplands.

The shelter-belt planting program was begun in 1937. During the first 5 years, about 1.5 million trees were planted along 300 miles of the planned 1,200 miles of windbreaks.

The shelter belts have been particularly effective in protecting crops against the dry searing sirocco, which blows in from the south late in spring and summer. However, winds from the northwest, prevalent in the winter months, must also be taken into consideration in shelter-belt orientation. Hence, the preferred pattern of planting is one that is rectangular rather than consisting only of parallel belts. In this respect, the Italian theory of shelter-belt design is much like that used by the United States Forest Service in 1935 to 1942 in the Great Plains Shelter Belt Project and by the Soil Conservation Service, which has carried on the work since that time.

Spacing between shelter belts in the Pontine Marsh area is variable. In localized areas in which there are many belts, spacings are as close as 200 meters, about one-eighth mile, between belts. With this intensity of planting, much of the land is protected. In view of the extensive area where this type of planting is possible, however, a great deal still needs to be done.

Much of the planting was done with potted trees because the adverse climate makes successful establishment of bare-root eucalyptus, pine, and cypress rather difficult. The trees are irrigated after planting to increase survival.

The shelter belts in the Agro-Pontino are of three classes. Class 1 belts are from 30 to 32 feet wide and are planted along the main drainage channels and streams. Class 2 plantings are three-row belts along

*This article is based on observations that Mr. Stoeckeler made during his visit to Italy last summer.

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roads. Class 3 consists of two-row belts along boundaries of properties or fields. Class 1 and 2 shelter belts have both conifers and broadleaf species. Class 3 belts have only broadleaf species, usually eucalyptus.

In 1939 after the trees had become established, Professor Aldo Pavari, Director of the Forest Experiment Station at Florence, and his coworker, M. Gasparini, began studying the effect of shelter belts on crop yields. They found that yields of wheat were increased by about 18 percent in an area extending from a point about 20 feet from the trees to as far out as 275 feet. Most of the tree belts near which crop-yield influences were studied were pine or eucalyptus, 16 to 33 feet tall. The zone of reasonably effective protection extends out to 10 to 15 times the height of the windbreaks. Since the ultimate height of the eucalyptus will probably be at least 60 to 70 feet, an effective area of crop increase may in time be about 200 to 300 yards. Making allowance for the amount of ground occupied by the tree belts, or sapped and shaded by them, it appears reasonable to assume that the over-all crop increase for the gross land area of a protected field would be from 5 to 10 percent.

Despite the importance of the shelter belts, little planting has been done since 1942. In fact, Professor Pavari estimates that perhaps 40 percent of the belts were entirely destroyed during the war due to the heavy demand for fuel wood. Some of the remaining belts have been damaged.

Replacement and repair of these belts, along with the planting of the new windbreaks required to complete the program, would seem to be a necessity. Not only will this undertaking increase crop yields, but it will also be a great stride forward in providing a considerable part of the fuel requirements of the farms in the reclaimed tract.

Part of the wood for fuel and other uses can be provided by careful thinning of the shelter belts and by the orderly harvesting of mature or dead trees. Any intermediate thinning of the shelter belts (before the trees mature) will probably prove to be a task in which farmers will need the guidance of foresters if the basic value of the tree plantings for wind protection is not to be seriously impaired. This is entirely possible because of the characteristics of the tree species selected for planting. Eucalyptus, the predominant type, grows from 3 to 5 feet in height each year and is capable of producing as much as 172 to 215 cubic feet per acre. This growth rate is rather outstanding compared with that of most tree species and considering the low rainfall of this part of Italy.

The natural woodlands in the Agro-Pontino area,

Forest nursery that supplies trees for reforestation and shelter belt planting in the Agro Pontine.

This two-row shelterbelt of eucalyptus along a road south of Cisterna not only beautifies the highway but also protects adjoining cropland.

consisting of oaks and chestnuts, have an annual production of only 35.7 cubic feet per acre. They are handled by a silvicultural system known as "coppice with standards." The larger oaks are used in the manufacture of railroad ties and barrels; the smaller ones, for fuel, often marketed in the form of charcoal. Chestnut is used for telegraph poles and barrel staves, and tannin is made from its bark. Fortunately for the economy of the area, there are about 23,000 acres of this type of forest. It is contributing substantially to the wood requirements of the population, under the careful guidance of local forest officers. Some block plantings of Italian stone pine and other species will eventually contribute much needed timber products.

There is a small forest nursery of 500,000-tree capacity in the region. Currently it is producing about 200,000 trees a year, most of which are distributed without charge to farmers and landowners for afforestation and planting of shelter belts.

In selecting species for planting, the chief considerations are adaptation to climate and soil, value for wind protection, rate of growth, ease of establishment, and possibility of serving the dual role of wood production and shelter belt.

Longbeak eucalyptus has proved to be an outstanding tree, with a very rapid growth rate, a high value for fuel and other uses, and the ability to resprout to form a second crop. Next to eucalyptus, the best species are Monterey cypress and Monterey pine. In some plantings the latter attained a height of 33 feet in 11 years. Other conifers that have proved valuable in shelter-belt planting are Italian cypress, Italian stone pine, and Arizona cypress.

There are also a considerable number of other broadleaf species that are used in the windbreaks, including blackwood acacia, Siberian elm, black locust, flowering ash, poplar, willow, sycamore, and mulberry.

It is interesting to note that many species that have proved successful are exotics from Australia, North America, and Asia.

From observations of the soils of the Agro-Pontino and the climatic conditions in south-central Italy, I believe there are some additional tree species from the United States that would be worthy of trial in Italy, especially those used in shelter-belt planting in Texas and Oklahoma. Among them are varieties such as Osage-orange, thornless honey locust, desert willow, and eastern red cedar that have outstanding growth rate, great ease of establishment as bare-rooted stock, good drought-hardiness, adaptability to stiff, heavy clay soils, and surprising freedom from insect pests and disease. In addition, some of the woods have a variety of uses that might make them valuable in the Italian economy.

In American shelter-belt nurseries, there are also certain techniques of mechanization and planting that seem adaptable to Italian conditions and might be useful in the reclamation projects now in the planning stage for southern Italy and the Mediterranean Islands.

Reading about... Foreign Agriculture

Manual de Lechería para la America Tropical, by R. E. Hodgson and O. E. Reed. 370 pp., illus. U. S. Bureau of Dairy Industry. For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C. $1.00.

The tropical countries of Central and South America now have a basic manual on modern dairy practice.

Dr. Hodgson wrote the book with the collaborative assistance of Mr. Reed after spending about a year of study in a group of tropical American countries at their invitation—Venezuela, Colombia, Panama, Costa Rica, Nicaragua, El Salvador, and Honduras. Part of this travel was under auspices of the Institute of Inter-American Affairs and part under auspices of OFAR.

An American Agricultural Attaché attends the dedication ceremony of Thailand's new irrigation project.

by **GRAHAM S. QUATE**

The Director-General of Thailand's Royal Irrigation Department drove us through the crowded streets of Bangkok with cheerful abandon. He is a small, keen-eyed wiry man who speaks with a slightly British accent and expresses himself with the easy facility of the world traveler that he is. This morning he was, as usual, bubbling over with optimistic enthusiasm. We were on our way to witness the dedication of one of his projects some hundred miles distant. Leaving the capital by way of Chulaloke Memorial Bridge, we threaded the winding streets of Thonburi on the right bank of the Chao Phya River and headed west.

For a mile or two the road was screened on either side by a seemingly indiscriminate mixture of betel-nut palms, coconuts, bananas, mandarin oranges, guavas, mangoes, and other less familiar plants. The Director regaled us with a running comment on our surroundings:

These orchards are quite valuable. The owners have something to sell almost every day in the year.

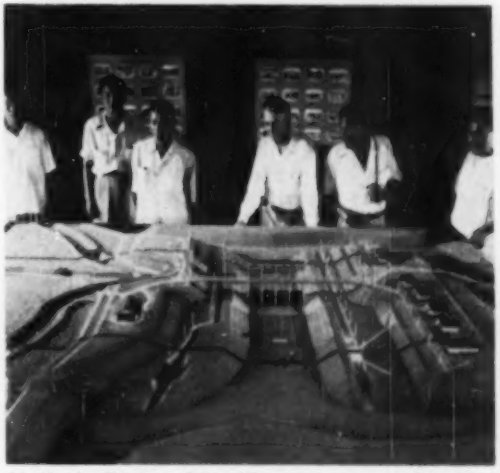
So instructed, we noticed that these were indeed cultivated lands with some sort of useful plant crowded onto every available foot of space.

The orchards ended abruptly and checkerboarded rice fields stretched ahead as far as we could see. The Director told us that we were leaving the river's bank:

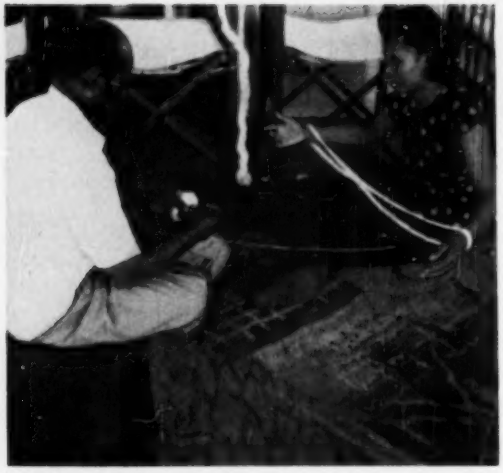
You see, this plain is so flat that floodwaters cover most of it about half of the time. Silt has accumulated for some distance on each side of the main channels and beyond these slight elevations we find great shallow basins in which only water-loving plants can grow. Rice is the best of these and a great blessing to this tropical lowland. At one time all of this expanse of level green was covered with dense jungle, inhabited principally by elephants and tigers. When these swampy jungle-lands were converted into rice fields, Siam, or Thailand as we'll call it now, became a prosperous country. Rice built the temples, the palaces, and the paved courtyards. Rice paid for the thousands of miles of canals that distribute the floodwaters and carry the crops to market. Early travelers wrote that the Siamese were more prosperous than the Europeans. But times have changed, the needs of a growing population exceed our riceland resources. Now we find ourselves obliged to develop the more difficult foothill country surrounding the Central Plain. When we reach our destination you will see how this is being done.

The road was rough and it was afternoon before we were out of sight of pot-bellied buffalo wallowing in the black mud of the rice fields. Near Ratburi or "Kingstown" the farmers were plowing with docile hump-shouldered cattle. Some of the fields carried crops of mung and soybeans, corn and peanuts. Tall palms stood along the borders of the fields, and the Director explained that these were sugar palms yielding a sweet toddy or sap that is boiled down into a thick brown syrup. He pointed out the bamboo climbing poles strapped to some of the palms as an aid to the tappers.

Beyond Petchburi, the next town, we entered an arid-looking section where a few bare castellated limestone hills rose above the low thorny scrub. The Director told us that we were in the rain shadow of the mountain range that marks the boundary between Thailand and Burma:



Thailand officials and Mr. Quate inspect a model of the Petch Barrage.



Weaving the Cord of Commandment, an important part of the dedication ceremonies.

The monsoon rains come principally from that direction but in this section the clouds are robbed of their moisture by those mountains and so we have here an arid belt. These soils are better than they look, they will yield bread if given a drink now and then.

A freshly dug canal crossed our highway at right angles. A signpost that stood near the bridge pointed along an unrutted road that followed the canal bank. The sign reminded me of some I had seen in the national parks at home. It was of lightly stained wood and the burnt-in lettering read, Petch Barrage—10 kilometers.

At this point, our companion, Phra Charoen Sheanakun, Dean of Engineering at the University of Chulalongkorn, evinced an interest in the trip. Through the farming districts, he had been serenely indifferent to the surroundings. At the sight of the cleared right-of-way stretching through the jungle, the canal with its unstained drop structures of concrete, and the as-yet-unused headgates and farm outlets, he became amiably loquacious.

The Dean looked at the signpost and with a broadening smile remarked that the name was very appropriate and meaningful. Then noting my puzzlement, he explained:

The Petch Barrage—the diamond bar. Petch means a thing of beauty and a measure of value. A barrage as you undoubtedly know is a bar to a river's passage, a means of increasing its depth, and includes the necessary facilities for safely diverting its waters. Our Central Plain barrages usually have a navigation lock, but here they're not feasible—this land is too steep.

I was interested in his peculiarly western accent, which he told me he had acquired in California where he had gone to college.

It was evident that the Dean was going to make an excellent informant.

When we reached project headquarters, the Director-General left us to prepare for his part in the dedication ceremonies. The Dean and I joined a group seated in a small pavilion located on an elevation that overlooked an impressive concrete structure. The structure was located in a deep, newly excavated channel through which now flowed the Petchburi River.

In the pavilion, seven yellow-robed priests were seated on a low platform facing an image of Buddha and were apparently ready to take part in the proceedings.

The Dean and I found seats at the back of the small crowd, where he could continue with my instruction. I asked if he thought it would be all right if I took some pictures of the priests and he replied that he could see no objection to it.

By way of getting our conversation started again I asked whether he enjoyed teaching the theory and philosophy of engineering. He said that he did, and that after having taught the theory for 30 years he had come to the conclusion that engineers do have a philosophy.

I remembered having been told that Buddhism is a philosophy rather than a religion and was interested in his comments on the philosophy of a Siamese engineer:

It revolves around the more or less modern idea that one can gain merit through the building of material things providing they are really meritorious and are undertaken in the proper spirit. Take this Petch Diversion Dam, for instance. This project was conceived in a spirit of unselfishness and has been organized so that no one person has or will hereafter gain from it more than his just dues. The planners and builders have gained merit.

I experienced a new interest in what was going on around us and asked about the activities of the man on the floor in front of us who seemed to be making cat's cradles. The Dean told me that he was simply weaving:

He is simply weaving the cord—the blessed or sanctified cord of commandment—I think you might call it. The man is linking a single slender thread—crocheting you might say—although he uses only his skillful fingers. Thus, from

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something weak, he produces a strong element that is used to convey a blessing and also to bind the priestly commands to vital parts of the structure we see before us. The weaving began yesterday and continued through the night; there is now enough of the cord to encircle the place to be blessed, but the weaving continues as part of the ceremony. Observe that the cord is attached to the image of Buddha, that it passes through the folded hands of the seven priests seated on his left, extends thence to the main structure, and from there to other nearby and related works. You will note that the cord has been carried around the area in an anticlockwise direction. That is because Buddha, as he sat facing the north, observed that the heavenly bodies moved from his right to his left. Noting this universal movement he concluded that Man, if he was ever to discover the beginning of things, should seek in an opposite direction; meaning, I believe, that one should oppose the ways of the world.

The Priest nearest the image of Buddha raised a fanlike screen before his face and began to chant, the others following his lead. The rapidly intoned voices reverberating through the pavilion conveyed a sense of urgency.

The Dean explained that the priests were saying just a few important words, many times repeated. And he handed me a page torn from his notebook:

This is not exactly what they are saying, but it gives you an idea. Reel that off rapidly and you get the general effect. Something like the whirring of a wheel, isn't it? And don't forget it's turning against the evil ways of the world.

The chanting paused and His Excellency, Phra Chuang Kaset Silpakarn, Thailand's Minister of Agriculture, accompanied by a group of uniformed officers of the Ministry, entered the pavilion. He was conducted to the seat of honor, near the east entrance overlooking the principal structure of the Petchburi Project.

The Director-General, Mom Luang, Xujati Kambhu, began the speech making. The Dean gave me a running account of what was being said. Kambhu expressed appreciation to the Minister and to his Government for making the project possible and described details of the project.

Upon the conclusion of the Director's speech the patriarchal Phra Chuang arose and remarked upon the auspiciousness of the occasion and upon the benefits to be derived from the project. He told the people that this was their property and that they should use and care for it accordingly. He concluded with the words: May the blessings of Phra Sri Ratana Tri, Holiness of the Universe, bestow every possible success upon those of you who have willingly performed your duties here and thus helped to bring prosperity to the people of this Kingdom.

As the talk was concluded, the Dean told me that the Minister was an excellent speaker and an original thinker as well:

When he went to the United States as a young man he asked what college was most likely to have no Siamese stu-

Priests at the dedication ceremonies.

Director-General of Thailand's Irrigation Department talks with one of the workers at the Petch Barrage.

dents. Wisconsin was recommended and the Minister went there because he wanted to place himself in a position where he would be forced to speak English. He succeeded and now has a wonderful command of that language.

Upon the conclusion of his speech, the Minister stepped to a prominently displayed switch box and threw some levers, putting into motion the hidden mechanisms that slowly lowered the massive headgates.

The ceremonies over, the Dean and I found a secluded spot in which to continue our conversation and I remarked that he seemed to be well pleased with the Diamond Barrage. He replied that this was indeed a happy day for him:

Nai Xu Prabhasthita, the Chief Engineer, who brought this project to completion is a pupil of mine. I am proud of its fine design, of the attention given to the countless little details that gives it such a finished appearance. The engineers on his project are all competent in their own right, but you may have observed here and there some suggestions of American influence. If so, I am not surprised. More than 30 engineers in the Royal Engineering Department have traveled and studied in the United States. The group that has had American training includes the Director-General himself and the Chief Engineer of this Project. The Chief spent an entire year traveling under the auspices of the United States Bureau of Reclamation, during which time he made an intensive study of the Big Thompson Project in western Colorado.

I stated that I had been impressed with the general appearance of efficiency that one observed in all divisions of the Royal Irrigation Department. When I added that much of this must come from leadership the Dean told me about the Director-General:

You may have noticed the impressiveness of his title, Mom Luang. That means he is of the royal clan, that his great-grandfather was a King. His first name Xujati, pronounced Chuchati, was bestowed upon him by a fond princess grandmother, and it means "Build up the nation." His last name, Kambhu, is the same as that of the guardian of the nine-tiered umbrella, a symbol of royalty. By the way, did you know that this is one of the first of Thailand's irrigation projects in the real sense of the word?

I asked about the Central Plain, with its 3 million acres of irrigated rice, its thousand miles of canals, its scores of barrages. The Dean replied that the Central Plain and the Petchburi Irrigation District are two quite different things:

Look at the topography of the country surrounding us—the mountain range to the westward; the river that ap-

proaches from the west and then turns abruptly to the north on its diagonal way to the Gulf of Siam; the rocky outcroppings dotting the somewhat irregular, narrow belt of land that lies between the foothills and the Gulf. We call all this the Petchburi Irrigation District. Here the Petchburi River flows in a fairly deep channel. On the Central Plain the Menam Chao Phya has no banks to speak of. In floodtime the Chao Phya and its affluents inundate 5,000 square miles, and the problem is to equalize the distribution of that immense flow over the entire area. One-fourth or possibly more of the Central Plain is planted to floating rice where in times of the drought the water may be only 4 or 5 feet deep instead of the 6 or 7 feet to which the crop is ordinarily accustomed. In the Petchburi District, water must be continuously delivered to the land if it is to produce. And look at the soils. In the Central Plain, they are heavy and entirely lacking in drainage, an ideal condition for rice. In the Petchburi District the soils are a light sandy clay loam that drink water so rapidly that rice could be kept flooded only with difficulty. On the Central Plain the canals are used for transportation purposes. At Petchburi, roads must be used—roads to carry the fruits, oilseeds, and fibers that this district will produce in abundance. On the Central Plain, you see a picture of the past; here at Petchburi you see a picture of the future—Thailand's future.

I commented that it must be expensive to develop an area like this. The Dean said that it is:

This project has cost 32 million baht, and eventually an additional 12 million will be needed for an impoundment reservoir to take the peak off occasional flash floods.

I made a calculation, remembering that what the Government calls a baht the people like to call a tical. A baht is a tical, a tical is a nickel. Altogether the project would take 44 million. I said that that must sound like a lot of money to the people. The Dean agreed but suggested that I consider what Thailand had gotten for its money:

Look at the barrage with its mechanically controlled headgates, each 20 feet wide and nearly as high. This river has an average flow of only 50 cubic feet per second but cyclonic storms may increase that to 50,000. You can't handle that sort of stream with pin money. Look at the 125 miles of canals within the district and the roads that follow the banks of most of them. Look at the hundreds of drop structures and farm outlets. From where you sit you can see the main structure and its overpass road that can safely carry 12 tons. You can see the slipway for the passage of occasional rafts of timber, and the fishladder. Oh, I see it's already in use.

The Dean pointed to a number of bathers in the artificial rapids and remarked that the river looked peaceful enough then, but that the bathing would not be so good when the flash floods of October and November begin to come down.

I asked why he thought they would be so bad:

It's all because of rails and locomotives. The Singapore-Bangkok line that was completed many years ago passes through this district. With the coming of this, shall we say, improvement, the forests were cleared to provide sleepers and timbers, logs and lumber, and wood for charcoal. Today nothing stands between the railroad and the foothills except scrubby second growth. The region has lost much of its beauty but now some of it will be restored. Eighty thousand acres will be tilled, four thousand new homes will be established, trainloads of fruits, oilseeds, cereals, and fibers will be produced. There shall be no more felling of trees for the

Field of floating rice photographed during a drought; water should be 2 to 3 feet deeper.

sake of thousands of cords of firewood to produce a few pounds of steam. We shall have homes instead of charcoal burners. The river shall be filled with fish instead of mud and driftwood. Not today or tomorrow, but eventually.

I was interested to know how he could reduce that 8,000 acres so neatly into 4,000 homes—why he had not said just 4 homes and 3,996 tenant families working for the landlords:

Because the wheel turns, we move forward. The Petchburi district rises with a new day. The Siamese inscription on the plaque says that The Petchburi Project has been built by the Thai people for the Thai people! The unoccupied lands in this district have been reserved for the people by the Government. No one can acquire these lands but heads of farm families or those who aspire to that happy station. Claimants must occupy, clear, and cultivate their claim. They may not transfer their land to another within 10 years after occupancy.

The heavy tropical dusk closed in about us and the blare of loudspeakers swelled over the area. From one of them came the magnified thump of drums and voices shouting an insistent rhythm. The Dean told me that that was the Ram Wong, a popular modern diversion, and suggested that we go over to watch.

The Ram Wong circle was located on a plot of recently planted lawn, softened by the afternoon shower. Bare feet had churned the surface of the dancing circle into a semifluid state, but this was no more than a slight inconvenience to the enthusiastic young dancers. The step was a slow forward stamp with emphasis on the movement of hands, arms, and shoulders.

The orchestra consisted of three small drums and a chorus of singers who were all competing for a place near the microphone. Noticing the presence of Americans, the singers decided to give a special number. It was a rousing rhythmical song that had a familiar ring. Presently the words took on meaning through the sheer force of repetition. They were "Shree bee kuming rouzy mouzing when she comes." The friendliness and spirited performance of singers and dancers created an exhilarating atmosphere. We bought out a flower vendor's stock for the prettiest of the girls. When we went away, it was with a feeling of regret that there were not enough garlands for everyone.

Wheat Processing and Uses in the Far East

by **H. A. BAEHR**

For many years the Far East has been a good market for United States wheat, especially the soft white wheat of the Pacific Northwest. However, the emphasis has been on selling; little or no follow-up has been made regarding the form in which wheat could best be used and how wheat products reached consumers. This is one of the reasons that the Office of Foreign Agricultural Relations of the United States Department of Agriculture, in cooperation with the Oregon Wheat Commission and the Washington State Department of Agriculture, recently sent a special mission [1] to the Far East.

Over-aging

Over-aging of flour is probably the greatest deterrent to expanded usage of wheat products in the Far East. Except for the Philippines, flour was found to be generally over-aged throughout the countries studied. Flour importers and other observers agreed that regular shipments of fresh flour and regular distribution to bakers and other flour users would stimulate the demand for wheat flour. How to meet these requirements, then, was one of the principal studies that we made. We considered two broad points: (1) possible poor inventory practices and (2) transportation.

In general, we concluded that under normal business conditions inventory control by businessmen is generally good; therefore this factor is not important in the over-aging of flour. Transportation definitely is important, but long-haul ocean transport probably cannot be avoided, considering ocean freight rates and schedules. No one can expect preferential handling for such a relatively low cost, bulky commodity as flour.

[1] The mission's study was conducted under the auspices of the Research and Marketing Act. Other members of the mission were A. M. Camp, President of the North Pacific Grain Growers, and E. J. Bell, Administrator of the Oregon Wheat Commission.

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A possible avenue for improvement in flour quality may be in the development of better packaging. In one area, we learned that some Canadian flour was packed in multiwalled bags. The report indicated that the package was useful in protecting and prolonging baking quality.

Of course, much of the flour used in the Orient is milled there. And, since the United States is interested in shipping not only flour but also wheat to the Far East, the mission was interested in observing milling and baking practices there.

Milling

Three Far Eastern countries—Japan, India, and Pakistan—have important flour milling industries. Each of the three countries has Governmental control as to percent extraction and permitted moisture levels in products. The milled products are either purchased by Government or the mills grind Government-owned grain on a fee basis, with Government agencies rationing and distributing the milled products.

Flour milling systems in these countries range from animal-powered, stone burr mills to electrically powered hammer mill systems with extensive sifting equipment and modern roller milling systems imported from the United States, England, and Germany. The best Japanese mills are the equal of any in these western countries.

The animal-powered burr mill or "chakki" found in the small towns and villages of India and Pakistan is just one step away from the hand-operated quern and chakki. The use of animal or motive power has not caused any particular change in the properties of atta, the almost whole-wheat meal ground by the Indian people since ancient times.

These larger units are partly commercial enterprises, but much of their activity is on a custom basis. Some improvement in wheat cleaning and added scalping operations has been made in the past. Greater attention to these and other factors such as wheat quality, generally improved housekeeping, and the labeling of atta were encouraged by the British Agricultural and Marketing Services prior to 1937. The result has been a more profitable operation since the better quality products commanded price premiums and the over-all operation tended to be better controlled and more economical, once the operator was convinced of the profit advantages of such practices.

Many roller mills also may be found in India and Pakistan. Most of them are owned by the nationals, but actual operation has been supervised by British, Canadian, and possibly Australian millers.

In these mills, the cleaning of wheat, including washing, and the rehandling of screenings in order to obtain maximum returns are common practice. The middlings purification system is shortened, but the grinding operations, particularly in the breaks, follow conventionally good practice by our standards.

Atta does not have the range of uses that make baking quality an important consideration; therefore, good milling practice is of no particular consequence as it influences quality. However, in normal operation, these mills produce flour, one or two grades of semolina (a coarser wheat product), atta, and millfeeds, simultaneously.

The Japanese have imported modern mills and have also constructed exact copies of this imported western machinery. Unlike those in India and Pakistan, these mills are operated by nationals. The Japanese mills are required at present to mill 85-percent extraction flour. Apparently because millers assume that such a long-extraction flour cannot be of good quality, the usual practices associated with quality production have been curtailed or eliminated, and the grinding method has been drastically changed. In some instances, white and red wheats have been intentionally

Market center for wheat, cotton, and wool in Pakistan.

Weighing bread dough in a Japanese bakery.

mixed before the grain was prepared for grinding, still on the premise that desirable quality was unattainable anyway.

In addition to these roller mills of up to 4,000- to 6,000-sack capacities, Japan has many small roller mills and hammer mill installations. Total production of flour is about equally distributed between large and small mills, with mills of 220-sack capacity per day or less producing 47 percent of the flour. Like those in the United States, small mills are often located in wheat-producing areas, but some of them are found in coastal cities.

Utilization

Bread

Our first concern in the utilization of wheat products usually is associated with bread as such and more specifically with yeast-leavened bread. Yeast-leavened baked products are not widely used in the Far East, however, and it is therefore convenient to discuss the baking practices of the several countries by comparison with American standards.

In general, bread in the Far East is more compact than American bread. In Indonesia, Singapore, Hong Kong, Siam, and India, this fact can be traced in part to the origins of the baking industry in the craftsmanship and traditions of the Netherlands and England. In all areas, the rate and extent of fermentation are much less than they are in the United States. Less sugar and fat is used, and in many cases they are not used at all because bakers cannot get them.

In Japan, straight doughs are the rule, although one large plant in Urgoya was using a sponge fermentation. In the Philippines and in Singapore, the sponge process is more common, but it is used more as a preferment for dry yeast than as an active sponge fermentation.

In the warmer areas, doughs are commonly fermented *on the bench,* particularly in some of the smaller and medium-sized shops. Live dry yeast and imported compressed yeasts are used except in Japan where domestically produced compressed yeast is available.

The importance of the bread baking industry in Japan is reflected in the existence of the vigorous yeast industry. The quality of compressed yeast was much more variable between and within plants than is the case in the United States, and the larger bakeries were obliged to compensate for this lack of uniformity by mixing yeasts from several suppliers.

The Japanese yeast plants were using low-grade molasses as a source of sugar, together with barley malt and ammonium sulfate as sources of nitrogen. Mashes are not as carefully filtered, nor is the yeast washed as carefully as in American practice. Temperature control and physical safeguards against contamination were rather limited. In some plants, the handling of yeast between final collection and pressing into cubes would permit deterioration.

The percentage of yeast that bakers could use was limited by the capacity of Japanese yeast plants and the quantity of raw materials available to the yeast industry. However, in spite of the imposed limitations, members of the industry were aggressively interested in improving their process and product. With a vigorous local industry, the import of compressed or live dry yeast does not appear to become a large item.

Throughout the Far East, bakeries range from the simplest hand shops with one or two workers to partly mechanized plants. Refrigeration as we use it for storage, dough-temperature control, and dough-room control is unknown. We did not see a divider, even in plants with several traveling ovens.

In Hong Kong, the Philippines, Singapore, Java, and Bangkok, most of the bakery business is in the hands of Chinese. Many small family shops appear to be the rule, although we visited some rather large Chinese-owned bakeries in Manila. There were no Chinese bakers in the part of Japan that we visited and relatively few in India.

Sanitation is more speculative than actual in most areas, but there are notable exceptions. The larger Japanese bakeries are clean and several biscuit plants that we visited in Pakistan had screened windows and well-kept interiors.

Bread and buns in general are unacceptable according to our ideas of quality, but, in spite of this, we observed repeated evidence of good practical craftsmanship on the part of even the smaller bakers. Luxury items, such as cakes, sweet rolls, sweet biscuits, and pastries, were seen in every market area and the quality was generally very good.

Chapatti (Atta)

Atta is the traditional and principal form of milled product in those areas of India and Pakistan where wheat is a staple item in the diet of the people, annual consumption of wheat being estimated as high as 350 pounds per capita. Atta is used in making chapattis, a sort of pancake made from unleavened and unfermented dough. The chapatti is the form in which most of the wheat is consumed in these areas. Flour and semolina are used in the making of special foods and sweetmeats for festive and ceremonial occasions. In the more remote communities, flour and semolina are obtained by sifting atta, while in areas where distribution permits, these more refined products are obtained from the roller mills. Flour, atta, or combinations of the two are used in the production of fermented products such as pan bread and a particular kind of chapatti variously named in different areas.

Other Products

An important outlet for wheat flour in the Far East is in the production of noodle and vermicelli products. Although a preference for strong high-protein flour was expressed in some localities, most of the production is from lower protein (8.5-10.0 percent) flours. In Japan, approximately 35 percent of the wheat flour consumed was in the form of noodles. In other areas, data regarding the relative amounts of flour used for various food products were inconclusive, although in general a large Chinese population was considered to be a natural outlet for substantial quantities of wheat flour in the form of noodles.

In some areas, notably Thailand, noodles were made from rice flour, and the apparent discrepancies between size of Chinese population and amount of wheat flour used was partly attributable to this practice. Because of the comparative costs of rice and wheat flour in usual commerce, it should be pointed out that broken rice and lower grades of rice are used for such production.

Noodle production in Japan is about equally divided between conventional dried noodles and precooked noodles that are sold in the wet form. In areas where rice noodles are made, several modifications of precooking are practiced, and the product may be sold either wet or dry.

In manufacturing noodles the Japanese use a very dry dough containing less than 25 percent water. The water is added in small quantities to the rapidly agitated flour to form a damp, crumbly mass that assumes the properties of a dough when subjected to pressure.

Weighing noodles for packing, Tokyo.

This crumbly mass is sheeted through a series of rollers and the sheet rolled upon a horizontal spindle, where it is permitted to "condition" while additional spindles are loaded. The dough from two, three, or four of these spindles is then combined in a second sheeting operation, the resultant sheet passed through a pair of rolls that cuts the dough into lengthwise strips, and the cut noodles caught on suitable rods and dried. Noodles are dried in rooms with high ceilings. Aside from natural convection and air movement through doors and windows, no provision is commonly made for controlled circulation. The preparation and handling of the dough for cooked noodles is comparable except that the operation is conducted on a smaller scale. The noodles are cooked, washed in cold water, drained, and weighed into suitable retail units.

The manufacture of biscuit products is widespread, and large plants were in operation in all the cities visited except Djakarta, Java. We encountered no production of yeast-fermented crackers, the entire production being in chemically leavened types ranging from hard tack to baby biscuits and in some cases to sugar-filled wafer types.

In this industry, the degree of mechanization, plant lay-out, and cleanliness were above average. Since biscuits have a reasonable shelf life and can be shipped into interior areas, it is not surprising that the industry as a whole is growing. It was interesting to learn that manufacturers plan to use the most modern equipment available in the expansion.

European Cooperatives

by G. E. RIDDELL

Cooperatives have a significance in the lives of Europeans far beyond that prevailing in the United States. It is true that about half of the farmers of the United States belong to some kind of cooperative organization, but the co-ops generally are not predominating influences in their business or social lives. In Western Europe, on the other hand, cooperatives have a place of high importance in almost everyone's daily life. Farmers sell much of their produce through cooperatives and city people buy a major portion of their groceries through cooperative stores. Cooperative newspapers are widely read and many young men and women attend cooperative colleges. People frequently buy their homes and do their banking through cooperatives.

Although they have become an integral part of the whole society in many countries of Europe, co-ops were originally set up to meet certain economic needs of members. It is natural therefore that references to the strength of cooperatives are usually taken primarily as allusions to their position in trade and their financial standing. In these respects they are definitely strong. In the consumer trade of most of the countries, cooperatives are dominant factors. This is especially true in Denmark, England, Finland, Scotland, Sweden, and Switzerland, known as the "Big Six." In Finland, consumer cooperatives handle at least 35 percent of the retail business and sell an even larger portion of many staple items. For instance, the cooperative stores affiliated with the two Finnish cooperative wholesale centrals sold 44 percent of the coffee and 46 percent of the sugar in 1949. The Cooperative Wholesale Society in Great Britain claims to be "not only the largest cooperative trading organization but one of the largest trading units in the world." Sixty thousand persons are normally employed in their stores, factories, and processing plants. During World War II, 25 percent of the civilian population of Great Britain received their basic food rations through cooperatives. Swedish consumer societies handle more than 20 percent of the total trade in household goods.

The Central Cooperative Committee or Council in Denmark is an interesting example of the scope of cooperative activities. Members of this Council include one or more central cooperative societies of the following categories: Dairies, hog slaughterhouses, egg and cattle exporters, poultry packers, fruit markets, coal, feed, fertilizer, dairy and seed suppliers, cement factories, agricultural insurance associations, savings banks, and machinery stations.

In various countries, there are many other kinds of cooperatives, including those for fishing, fur farming, forestry, water supply, and animal breeding.

In nearly all countries there is rapid expansion in farm machinery cooperatives or machinery stations. This tendency is somewhat reflected in changes taking

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place in the machinery trade in Sweden. In 1938, co-ops were not handling farm equipment, but by 1946 the agricultural supply cooperative (SLR) handled 27 percent and the Consumers Wholesale (KF) 2 percent of the total farm machinery sold in that country.

At the present time, cooperatives in most European countries are restricted in foreign trade by governmental controls affecting imports and exports.

They are, nevertheless, important factors in the export programs. Cooperatives dominate the trade in agricultural products and farm supplies in Denmark, Finland, France, the Netherlands, Italy, Southern Germany, Sweden, and Switzerland. Practically every farmer in these countries who has anything to sell from his farm is a member of one or more cooperative associations.

In Denmark, two-thirds of the total exports are of farm products. The cooperatives handle 80 percent of these agricultural exports. Seventy-five to ninety percent of the milk and dairy products sold in the Big Six and a larger proportion of exports are handled through cooperatives. In Holland practically all of the fruits, vegetables, and flowers are sold through cooperative auctions.

As for imports, Belgium and Switzerland are the only two countries where available dollar exchange and governmental policies allow relative freedom of direct buying in the United States. The Federazione dei Consorzi Agrari in Italy, however, is buying all grain for Italian requirements and is in a position to purchase in this country.

The trading preferences of European cooperatives and their strong position in trade combine to make them important potential outlets for United States farm products. The survey that I made early this year [1] indicates that a substantial trade could develop when dollars are available or when sales can be made in European currencies. European co-ops are highly interested in purchasing as near as possible to producer sources. This desire and their prevailing preference to trade with cooperatives offer favorable opportunities for United States cooperatives to participate in foreign trade when free trade is possible.

As purchasers of production supplies for farmers, the agricultural supply cooperatives are the most significant factors in trade with the United States. In nearly all the countries of Europe, they are importing concentrated feed, especially protein concentrates. They also wish to purchase farm equipment manufactured in this country.

Agricultural producer cooperatives in Europe have normally found little outlet for their produce in the United States. If, however, wines, cheeses, and other specialized items are to be imported from Europe, the cooperatives will generally be important sources.

Because of their strength and their relationship to the majority of people in Western European countries, cooperatives seem to have been a favorable instrument for encouraging democratic political and social relationships. To me it is significant that democracy is stronger and more in evidence in the countries where the influence of free cooperatives is greatest. Finland,

[1] The survey, conducted under the auspices of the Research and Marketing Act, was a follow-up of that made in 1949 by J. H. Heckman. See *Foreign Agriculture*, July 1949, "Cooperative Customers Abroad," and Foreign Agriculture Report No. 39, October 1949, published by the Office of Foreign Agricultural Relations.

In many European towns, the corner grocery store is a cooperative.

where the co-op membership of 1,330,000 represents more than half of the families, is an example.

I talked with a leading cooperative official about the strength of democratic relations in Finland and suggested that the cooperatives might have been quite a factor in developing and maintaining these relations. He said that this was definitely the case and called attention to the conditions prevailing in the country in the latter part of the nineteenth century and the early part of the twentieth when the cooperatives made greatest progress and their influence became well established. It was in this period that the Finns were suffering great economic hardships and oppression at the hand of the Czarist Russian Government. It was at the time of the Panslavic Movement when there was an intensified effort to Russianize the Finns. The cooperatives grew up in this period, serving patriotic as well as economic objectives.

It is no coincidence that the countries having the highest degree of literacy in Europe are those where free cooperatives have had the greatest influence over the past 50 years. It is generally recognized that an informed, understanding membership is as important to the success of cooperatives as an educated electorate is to successful democracy in government. Cooperatives therefore have naturally given attention and support to education. Their major educational activities are conducted through various kinds of programs carried out by local societies. In practically all of the countries I visited, however, the consumer cooperatives have cooperative colleges, in addition to special schools for employees. The Cooperative College operated by the Cooperative Union, Ltd., in England can accommodate 110 residential students in regular sessions and for formal education. It is a general cultural center for the cooperative movement.

In addition, cooperatives are publishing newspapers and magazines for their membership and special publications for their employees. The weekly newspaper published by SOK in Finland has a circulation of 306,000, which makes it the country's largest newspaper. The Federation of Swedish Farmers Association in Sweden published Agriculture Cooperative News, which reaches 370,000 farmers—practically all of them.

The cooperatives also have taken a major responsibility in most Western European countries for providing the kind of assistance that is given by the Agricultural Extension Services in this country.

The common interests existing among cooperatives in Europe and the United States not only provide opportunity for creating international good will but also for exchanging experiences on the functioning of the co-ops themselves. All this paves the way for the increased trade that we hope will come about between cooperatives in Europe and the United States when currency problems are worked out.

One of the 160 cooperative auctions in the Netherlands through which most of the fruits and vegetables are marketed.

Technical Cooperation With Eastern Countries

The United States Department of Agriculture, in cooperation with the Department of State, is now extending its technical cooperation to six Eastern countries and expects soon to participate in programs of agricultural improvement with others of the area as well.

This international sharing of agricultural knowledge and skills is carrying out purposes of Public Law 535, "Act for International Development," recently passed by the Eighty-first Congress. The activity sometimes is referred to as the "Point IV Program" since it had its origin in the fourth point of President Truman's inaugural address of 1949, proposing that nations share their technical advancements.

Ceylon, India, Iran, Pakistan, the Philippine Republic, and Thailand are the six Eastern countries with whom such cooperative relationships have been established. In all cases special representatives of the Department of Agriculture have been stationed in the participating countries at the latter's invitation.

In Ceylon the Department of Agriculture representative is J. M. Thomason, veteran of 33 years of agricultural extension work in Arkansas. He is assisting the Government of Ceylon in educational phases of its drive to increase production of rice, Ceylon's principal food.

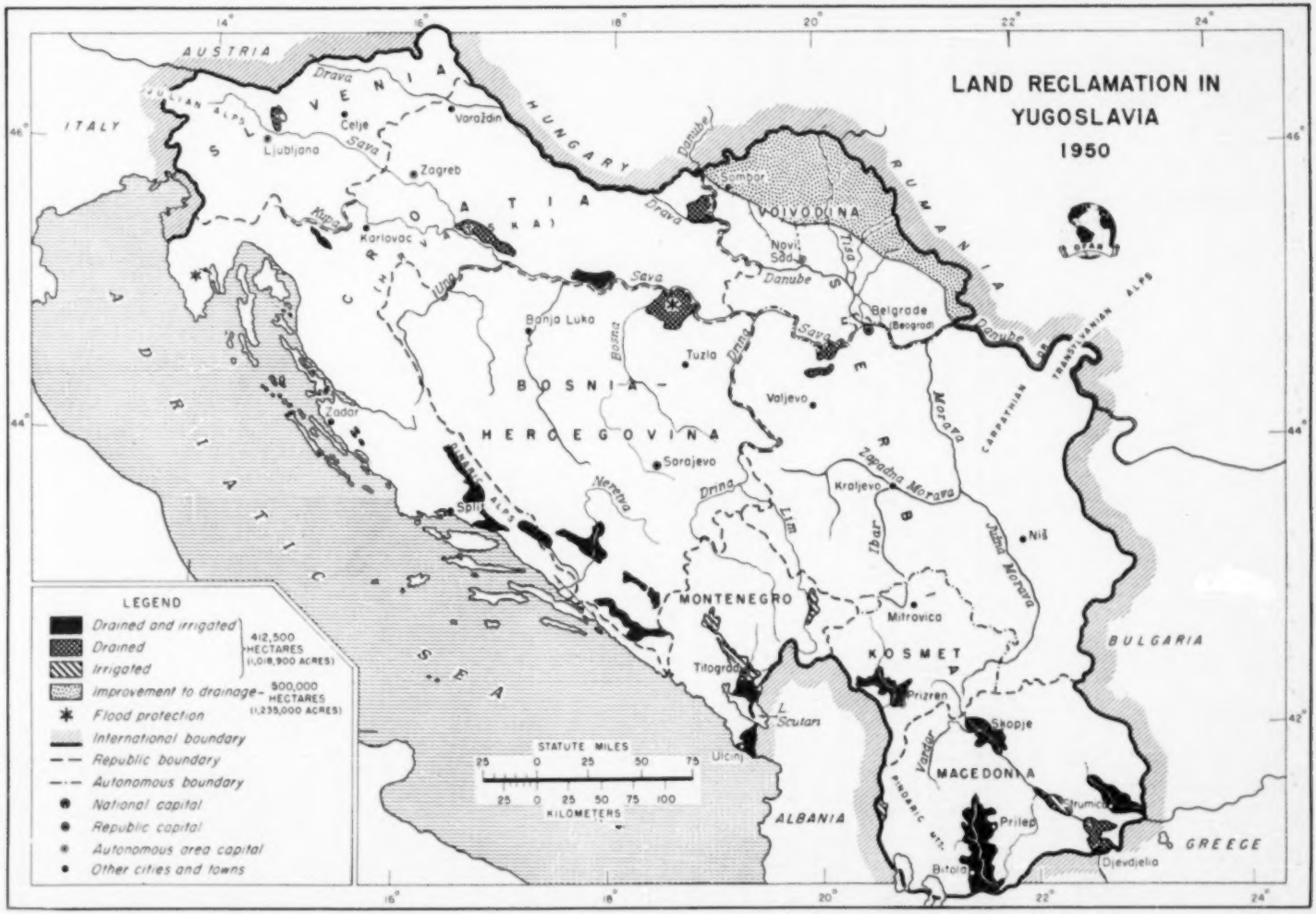
In India two Department representatives have taken up stations as consultants to the Ministry of Agriculture. One is Earle K. Rambo, former University of Arkansas extension engineer, who is collaborating with the Indian Government's effort to bring greater mechanization into its agriculture. The other is Ford M. Milam, a Department agronomist with background experience in both El Salvador and Korea, who is aiding the development of agricultural research.

In Iran the two Department representatives are Dr. Franklin S. Harris, president-emeritus of Utah State Agricultural College, and Hoyt Turner, former specialist in agricultural education in the State of Georgia. Dr. Harris knows Iranian agricultural conditions well, having been agricultural adviser to the Government of Iran in 1939–40. Similarities between arid conditions of Iran and areas of western United States are enabling him to apply directly his years of American agricultural leadership.

In Pakistan the Department representative is Karl Knaus, veteran of 35 years of State and Federal agricultural extension leadership. He is working with the Government of Pakistan in the development of its rural welfare and extension services.

In the Philippines the two Department representatives are John V. Hepler, veteran of 32 years of agricultural extension activity, and Dr. Otto A. Reinking, widely recognized tropical plant pathologist of Cornell University. Mr. Hepler is working with the Philippine Department of Agriculture and Commerce to further the coordination of its agricultural extension services. Dr. Reinking is assisting Philippine plant scientists as special adviser on plant disease problems, including those affecting the two leading crops, abaca (Manila hemp) and coconuts.

In Thailand also are two Department representatives, assisting with rice-improvement and agricultural research work. One is Dr. Harry T. Love, Cornell University plant scientist, who is aiding the development of superior varieties of rice and the improving of cultural practices. The other is Dr. Robert L. Pendleton, former professor of geography at Johns Hopkins University, nationally known expert on soils, and authority on Far Eastern agriculture.


LAND RECLAMATION IN YUGOSLAVIA 1950
AUSTRIA
ITALY
HUNGARY
ROMANIA
BULGARIA
GREECE
ALBANIA
SLOVENIA
CROATIA
VOJVODINA
BOSNIA-HERCEGOVINA
MONTENEGRO
KOSMET
MACEDONIA
SERBIA
ADRIATIC SEA
Drava
Sava
Danube
Tisa
Una
Bosna
Drina
Neretva
Morava
Zapadna Morava
Ibar
Lim
Vardar
Ljubljana
Celje
Varaždin
Zagreb
Karlovac
Sombor
Novi Sad
Belgrade (Beograd)
Banja Luka
Tuzla
Valjevo
Sarajevo
Kraljevo
Niš
Mitrovica
Prizren
Shopje
Titograd
Scutan
Ulcinj
Priled
Bitola
Djevdjelia
Zadar
Split
Julian Alps
Transylvanian Alps
Carpathian
Pindaric mts.
LEGEND
Drained and irrigated
Drained
Irrigated
412,500 HECTARES (1,018,900 ACRES)
Improvement to drainage
500,000 HECTARES (1,235,000 ACRES)
Flood protection
International boundary
Republic boundary
Autonomous boundary
National capital
Republic capital
Autonomous area capital
Other cities and towns
STATUTE MILES
KILOMETERS
14°
16°
18°
20°
22°
24°
46°
44°
42°